

## ILLEGITIMATE DUPLICATION PREVENTING METHOD, DATA PROCESSING APPARATUS AND MEDICAL IMAGING APPARATUS

### BACKGROUND OF THE INVENTION

5           The present invention relates to an illegitimate duplication preventing method, data processing apparatus and medical imaging apparatus, and more particularly to a method of preventing illegitimate duplication of a program, and a data processing apparatus and medical imaging apparatus comprising means for preventing illegitimate duplication  
10       of a program.

          A program in a data processing apparatus is protected by measures for preventing illegitimate duplication. One such technique is to make a program executable by a user writing specific information such as a product ID (identification) code into the program during installation of the  
15       program into the data processing apparatus. Another technique involves storing specific information input by a user into the data processing apparatus, and justifying the user by the program checking the information when it is executed.

          Still other techniques include a method in which a flexible magnetic  
20       disk or the like that has key information stored in it is distributed along with a program and the program is configured so that it should always be used with the flexible magnetic disk, thereby ensuring that only a legitimate user can use the program, and a method in which a specific hardware is distributed along with a program and the program is configured so that it  
25       becomes executable only when the hardware is incorporated into the data processing apparatus.

          Among these conventional techniques, the method in which specific information is written into a program makes a change in a part of the program, and therefore the program may be corrupted due to a mistake  
30       or the like in writing the information, and in addition, the program does not

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have a function to avoid duplication after writing the information.

The method in which a program itself checks specific information written in the data processing apparatus requires a user to write complicated information, which is cumbersome, and a special processing  
5 procedure is needed in the program to interpret the information, thereby reducing efficiency.

On the other hand, the method involving concurrent use of a flexible magnetic disk has a problem that the information medium is not highly reliable, and the method involving concurrent use of a hardware  
10 increases costs and is more restricted in handling during distribution compared to programs or the like that can be distributed on-line via a network. Moreover, if the medium or the hardware is lost, the program cannot be used any more.

## 15 SUMMARY OF THE INVENTION

It is an object of the invention to provide an illegitimate duplication preventing method which assuredly prevents illegitimate duplication of a program by a simple technique, and a data processing apparatus and medical imaging apparatus comprising such illegitimate duplication  
20 preventing means.

In accordance with a first aspect of the invention, there is provided an illegitimate duplication preventing method comprising the steps of: creating license information as information in the form of a run-time read module in a data processing apparatus by a creation program that self-  
25 destructs after being executed; and executing a program that is installed in the data processing apparatus without the license information and is incomplete without the license information, with the license information read during the execution.

In accordance with a second aspect of the invention, there is  
30 provided a data processing apparatus comprising: license information

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creating means for creating license information as information in the form of a run-time read module by a creation program that self-destructs after being executed; and program executing means for executing a program that is installed without the license information and is incomplete without the license information, with the license information read during the execution.

In accordance with a third aspect of the invention, there is provided a medical imaging apparatus comprising medical image acquisition means for acquiring an image of a subject, image processing means for processing the image, and display means for displaying the processed image, wherein the image processing means comprises: license information creating means for creating license information as information in the form of a run-time read module by a creation program that self-destructs after being executed; and program executing means for executing a program that is installed without the license information and is incomplete without the license information, with the license information read during the execution.

According to the illegitimate duplication preventing method, data processing apparatus and medical imaging apparatus in the first through third aspects of the invention, a program itself reads license information during execution of the program, and then operates as a complete program. Since the program as installed lacks the license information, it does not act properly when duplicated. Since the license information is created by a self-destructive program, it cannot be created more than once.

The present invention thus provides an illegitimate duplication preventing method which assuredly prevents illegitimate duplication of a program by a simple technique, and a data processing apparatus and medical imaging apparatus comprising such illegitimate duplication preventing means.

Further objects and advantages of the present invention will be apparent from the following description of the preferred embodiments of the invention as illustrated in the accompanying drawings.

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## BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a block diagram of an apparatus in accordance with one embodiment of the present invention.

5           Figure 2 is a block diagram of an image processing section in the apparatus shown in Fig. 1.

Figure 3 is a diagram conceptually illustrating a program in the apparatus shown in Fig. 1.

10           Figure 4 is a flow chart of a procedure to install the program shown in Fig. 3.

Figure 5 is a flow chart of the operation of the apparatus shown in Fig. 1.

Figure 6 is a schematic diagram of image display by the apparatus shown in Fig. 1.

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## DETAILED DESCRIPTION OF THE INVENTION

20           The present invention will now be described in more detail with reference to embodiments shown in the accompanying drawings. Figure 1 shows a block diagram of a medical imaging apparatus which is one embodiment of the present invention. The configuration of the apparatus represents an embodiment of the apparatus in accordance with the present invention, and the operation of the apparatus represents an embodiment of the method in accordance with the present invention.

25           As shown in Fig. 1, the present apparatus has a signal acquisition section 2 for acquiring a signal from a subject 4 for producing a medical image. The signal acquisition section 2 may be used in several forms according to the type of the medical imaging apparatus.

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For example, an X-ray CT apparatus employs a gantry comprising an X-ray emanating/detecting system for scanning the subject 4. An MRI apparatus employs a magnet system for acquiring a signal from the subject 4 using magnetic resonance. An ultrasonic imaging apparatus employs an ultrasonic probe for transmitting ultrasound into the subject 4 and receiving its echo. In any case, such existing signal acquisition section 2 can be utilized. In other medical imaging apparatuses, their respective conventional signal acquisition sections 2 may be used according to the type of the apparatus.

10       The signal acquisition section 2 is connected to an image producing section 6, and inputs the signal acquired from the subject 4 to the image producing section 6. The image producing section 6 produces an image based on the signal input from the signal acquisition section 2. The signal acquisition section 2 and the image producing means 6 together  
15       represent one embodiment of the medical image acquisition means in accordance with the present invention.

20       The image producing section 6 also may be used in several forms according to the type of the medical imaging apparatus. For example, the X-ray CT apparatus employs an apparatus (for example, a computer) for backprojecting projection data for a plurality of views of the subject 4 and reconstructing a tomographic image. The MRI apparatus employs an apparatus (for example, a computer) for reconstructing an image by an inverse Fourier transformation on a magnetic resonance signal. The ultrasonic imaging apparatus employs an apparatus for generating a B-mode image or the like based on the intensity of ultrasonic echoes. In  
25       any case, such existing image producing section 6 can be utilized. In other medical imaging apparatuses, their respective conventional image producing sections 6 may be used according to the type of the apparatus.

30       The image producing section 6 is connected with an image processing section 8 for processing the image produced by the image producing section 6 and producing an image suitable for display. The image processing section 8 represents one embodiment of the image

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processing means in accordance with the present invention. The image processing section 8 is comprised of, for example, a computer. Detailed description of the configuration of the image processing section 8 will be made later.

5           The image processing section 8 is connected with a display section 10 for displaying the image output from the image processing section 8 and other information. The image display section 10 represents one embodiment of the display means in accordance with the present invention. The image display section 10 is comprised of, for example, a  
10   graphic display.

          The image processing section 8 is also connected with an external input section 12 for inputting a program or data etc. to the image processing section 8. The external input section 12 may be any appropriate device according to the type of an input information medium,  
15   such as an optical disk playback device, i.e., a so-called CD-ROM (compact disk read only memory) drive, an MO (magnetic optical) disk drive, and an FDD (flexible disk drive). Besides, if the input information is distributed via a network such as Internet, a corresponding communication device is used as the external input section 12.

20           The signal acquisition section 2, the image producing section 6, the image processing section 8, the display section 10 and the external input section 12 are each connected to a control section 14. The control section 14 is comprised of, for example, a computer. The control section 14 supplies control signals to the above-listed sections to control their  
25   operation. Similarly, the control section 14 is supplied with status information signals or the like from these sections.

          The control section 14 is connected with an operating section 16 which allows an operator to input several commands and information etc. The operating section 16 is comprised of, for example, an operation panel  
30   that has a keyboard, a pointing device such as a mouse, and other operating devices. A portion consisting of the image processing section 8, the display section 10, the control section 14 and the operating section 16

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represents one embodiment of the data processing apparatus in accordance with the present invention. While description will be made with reference to an example in which the data processing apparatus is a data processing apparatus for a medical imaging apparatus, the data processing apparatus is not limited thereto but may be a general data processing apparatus such as a personal computer or an engineering workstation.

Figure 2 shows a block diagram of the image processing section 8. As shown, the image processing section 8 has a CPU (central processing unit) 802. The CPU 802 is connected with a main memory 806, an external memory 808 and interfaces 810, 812, 814, 816 via a bus 804. The CPU 802, the main memory 806 and the external memory 808 together represent one embodiment of the license information creating means in accordance with the present invention. They also represent one embodiment of the program executing means of the present invention.

The main memory 806 is comprised of, for example, a RAM (random access memory). The external memory 808 is comprised of, for example, a HDD (hard disk drive). The interfaces 810, 812, 814 and 816 are for use with the control section 14, the display section 10, the image producing section 6 and the external input section 12, respectively.

The external memory 808 stores an image processing program and other several programs executed by the CPU 802. These programs are installed from the external input section 12 via the interface 816. The external memory 808 also stores image data input from the image producing section 6 via the interface 814. The external memory 808 furthermore stores data (conditional data) prescribing conditions for applying several kinds of processing to the image data. The conditional data may be specified and changed from the operating section 16 via the control section 14 and the interface 810. The image stored in the external memory 808 is supplied to the display section 10 via the interface 812 and can be displayed as a visual image.

Of the programs installed in the external memory 808, a diagram of

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performed by the mouse but may be performed by any appropriate operating device.

In response to such change in the window width and level, the image processing section 8 performs a window change processing on the image data pertinent to the segment 40 at Step 712. At Step 714, the processed image is inlaid into the segment 40 on the screen, and is displayed along with the unprocessed portion.

Thus, the image in the segment 40 is one that reflects the change in the window width and level, as exemplarily shown in Fig. 6(c). Since the image processing on the segment 40 associated with the condition change is performed within a period of about 30 ms, for example, an image can be displayed reflecting a continuous condition change in real-time.

The operator continues to adjust the window width and level while observing such an image until a satisfactory image is obtained in the segment 40. This is shown as a loop of Step 710 through 716 in the flow chart. Since the result of the condition change is reflected on the image in real-time, the adjustment can be efficiently carried out. When a satisfactory image is obtained in the segment 40, the operator releases the mouse button. At this time, the image processing condition is determined. Alternatively, the determination of the processing condition may be done by an appropriate key operation.

In response to the determination of the window width and level, at Step 718, the image processing section 8 performs the window change processing on the image data for the entire screen image using the specification values finally determined, and displays the processed image on the display section 10 at Step 720. As exemplarily shown in Fig. 6(d), the entire screen image is thus displayed with the suitable window width and level.

Such image processing is performed on each of desired images. When the processing on all the images is completed and the program is terminated, the license information is separated from the program body.

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Many widely different embodiments of the invention may be configured without departing from the spirit and the scope of the present invention. It should be understood that the present invention is not limited to the specific embodiments described in the specification, except as  
5 - defined in the appended claims.

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